Livestock Grazing and Vegetative Management in the Big 6 Geographic Area

Threatened, Endangered, Proposed, and Sensitive Plant Biological Evaluation

Prepared By:

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Introduction

Threatened and endangered species are managed under the authority of the Federal Endangered Species Act (PL 93-205, as amended) and the National Forest Management Act (PL 94-588). The Endangered Species Act requires federal agencies to ensure that all actions are not likely to jeopardize the continued existence of any threatened or endangered species. In 1996, the U.S. Fish and Wildlife Service, which administers the Act, revised the candidate list to define candidate species as those species for which "there are sufficient information on their biological status and threats to propose them as threatened or endangered" under the Act. Section 7 of the Act provides direction to federal agencies regarding consultation requirements on any projects where an effect to threatened or endangered species may occur, and includes the preparation of a Biological Evaluation.

A Biological Evaluation (BE) provides a process to review all Forest Service planned, funded, executed or permitted programs and activities for possible effects on threatened, endangered, proposed or sensitive species (TEPS) (Forest Service Manual 2672.4). BEs are intended to help ensure that Forest Service actions do not contribute to a loss of viability or any native or desired non-native plant or animal species or contribute to trends toward Federal listing of any species. They provide a process and standard to ensure that TEPS species receive full consideration in the decision-making process (FSM 2672.41). Further management requirements can be found in the Bighorn National Forest Land and Resource Management Plan. Forest Service sensitive species are selected by the Regional Forester, and are species for which viability is of concern.

The effects analysis in the BE is required to address any direct, indirect, and cumulative effects of an action on threatened or endangered species or their critical habitat (50 Code of Federal Regulations [CFR] 402.02) and on sensitive species or their habitat (FSM 2672.42). This BE also complies with Section 7 of the Endangered Species Act (ESA), which requires all Federal Agencies, in consultation with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS), to insure that their actions are not likely to jeopardize the continued existence of threatened, endangered or proposed species or adversely modify their habitat.

Viability for TES species on the Forest was assessed in the 2005 Revised Forest Plan FEIS and associated documents. This analysis tiers to the analyses and species assessments conducted as part of the Revised Plan and incorporates them by reference. The disturbances anticipated from this project occur within the scope (extent, timing) of those analyzed in the Revised Plan FEIS. The following analysis describes any site specific details of this project relative to the TES species.

The purpose of this Biological Evaluation (BE) is to identify likely effects of the proposed action to threatened, endangered, proposed, and Forest Service Region 2 sensitive wildlife species. The federally threatened, endangered, and proposed species to be addressed in this Biological Evaluation were identified in a species list (dated May 22, 2009) received from the U.S. Fish and Wildlife Service. The biological evaluation addresses species that meet the following criteria:

1) Species that are known to occur on or near the Big Six Range AMP Project Area based on confirmed sightings.

2) Species that may occur on or near the Big Six Range AMP Project Area based on reliable unconfirmed sightings.

3) Based on the presence of potential habitat for the species on or near the Big Six AMP Project Area.

Forest Service Policy. - The USDA Forest Service has developed policy regarding the designation of plant and animal species (Forest Service Manual (FSM) 2670; Supplement 2600-94-2). The Regional Forester's sensitive species list contains taxa only when they meet one or more of the following three criteria:

1) The species is declining in numbers or occurrences and evidence indicates it could be proposed for federal listing as threatened or endangered if action is not taken to reverse or stop the downward trend.

2) The species' habitat is declining and continued loss could result in population declines that lead to federal listing as threatened or endangered if action is not taken to reverse or stop the decline.

3) The species' population or habitat is stable but limited.

Forest Service Objectives. - Under FSM 2672.41, the objectives for completing Biological Evaluations for proposed Forest Service programs or activities are:

1) To ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or animal species or trends toward Federal listing of any species listed as sensitive by USDA Forest Service Region 2.

2) To comply with the requirements of the Endangered Species Act, actions of Federal agencies may not jeopardize or adversely modify critical habitat of federally listed species.

3) To provide process and standard by which to ensure that threatened, endangered, proposed, and sensitive species receive full consideration in the decision making process, and to enhance opportunities for mitigation.

FSM 2600, Section 2671.44 (Supplement 2600-94-2), provides direction on the review of actions and programs authorized, funded or implemented by the Forest Service relative to the requirements of the Endangered Species Act.

Issue 6, wildlife, fish and plant TES species, MIS, and species of local concern are included in this analysis. The remaining issues listed below are not discussed/analyzed in this report, because they are discussed and analyzed in other specialists' reports found in the project record.

- Issue 2 aspen stands, Issue 3 riparian vegetation, Issue 4 upland vegetation, Issue 5 Socio/Economic, Issue 6A bighorn sheep, Issue 7 water quality, Issue 9 range improvement design, Issue 10 heritage resources, Issue 11 scenic integrity, Issue 13 gates being left open.

II. Description of the Proposed Action

The Big 6 Geographic Area Livestock Grazing and Vegetation Management Analysis encompasses 43 livestock grazing allotments on the Bighorn National Forest, covering approximately 401,738 acres. It is made up of five project areas called Beaver Creek, Goose, Little Horn, Rock Creek, and Tensleep that fall within six geographic areas. For purposes of this report, the term *analysis area* will be used to reference the entire analysis area, and the individual project areas will be referenced by name. The analysis area encompasses lands from the Montana-Wyoming border on the north end of the forest, lands along both the east and west slopes, down to the southern end of the Forest in Tensleep Canyon.

The Bighorn National Forest proposes to update management strategies on 43 grazing allotments using adaptive management. Prescribed burning will be added for habitat improvement and fuels reduction to help prevent large wildfires. The main actions proposed would be to develop

allotment specific objectives and actions to meet Forest Plan goals, and to authorize management of livestock and construction of improvements that will result in meeting those objectives. Objectives can be found in the Environmental Impact Statement for this project, as well as the purpose and need for the project. Table 1 shows the allotments being analyzed.

Table 1 Allotments within Big 6 by Project Area

Project Area	**Allotment**	**Allotment Acres**	**Project Area Acres**
Beaver Creek	Antelope Ridge S&G	3092	
	Bear/Crystal Creek S&G	7329	
	Beaver Creek S&G	4175	
	Finger Creek C&H	2589	
	Grouse Creek S&G	3904	
	Hunt Mountain S&G	9789	
	Little Horn S&G	5027	
	Matthew's Ridge C&H	605	
	Red Canyon C&H	6445	
	Red Canyon S&G	2905	
	South Park C&H	1170	
	Sunlight Mesa C&H	12797	
	Whaley Creek S&G	6485	
	Wiley Sundown C&H	4632	
Beaver Creek Total		***70944***	***70944***
Goose Creek	Big Goose C&H	11504	
	Little Goose C&H	29060	
	Little Goose Canyon C&H	1152	
	Rapid Creek C&H	14398	
	Stull Lakes C&H	19177	
	Tourist Horse GRA	5000	
	Walker Prairie C&H	30522	
Goose Creek Total		***110814***	***110814***
Little Horn River	Dry Fork Ridge C&H	7493	
	Fisher Mountain C&H	1775	
	Lake Creek C&H	29408	
	Little Horn C&H	13380	
	Lower Dry Fork C&H	7173	

	Red Springs C&H	24448	
	Sage Basin C&H	7391	
	West Pass C&H	2485	
	Wyoming Gulch C&H	8311	
Little Horn River Total	***101864***	***102080***	
Rock Creek	Rock Creek C&H	28799	
Rock Creek Total		***28799***	***28799***
Tensleep Creek	Baby Wagon S&G	3703	
	Dry Tensleep C&H	5294	
	Garnet Creek S&G	4347	
	Hazelton S&G	4243	
	Leigh Creek S&G	2741	
	McLain Lake S&G	7852	
	Monument C&H	2687	
	North Canyon C&H	11879	
	South Canyon C&H	12990	
	Tensleep Canyon C&H	3070	
	Upper Meadows S&G	4101	
	Willow S&G	11160	
Tensleep Creek Total	***74066***	***89101***	
Grand Total		**386487**	**401738**

Under the Bighorn National Forest Revised Land and Resource Management Plan (November 2005), the area is composed of the management areas and approximate acreages shown in Table 2 below.

Table 2-Management Unit Acres within Big 6

Management Area		Acres
1.11	Pristine Wilderness	26302.75
1.13	Semi-primitive Wilderness	7285.77
1.2	Recommended Wilderness	15577.59
1.31	Backcountry Recreation, Non-motorized Use	7960.78

1.32	Backcountry Recreation, Non-motorized Summer Use with Limited Winter Motorized Use	27048.44
1.33	Backcountry Recreation with Limited Summer and Winter Motorized Use	4337.35
1.5	National River System - Wild Rivers	10993.71
2.2	Research Natural Areas	6006.70
3.31	Backcountry Recreation, Year-round Motorized Use	11737.99
3.4	National River System – Scenic Rivers (Outside Wilderness)	2891.24
3.5	Plant and Wildlife Habitat Management	39682.94
4.2	Scenery	22750.00
4.3	Dispersed Recreation	19007.04
5.11	Forest Vegetation Emphasis	31055.68
5.12	Rangeland Vegetation Emphasis	70471.18
5.13	Forest Products	39586.35
5.4	Plant and Wildlife Habitat	15306.89
5.41	Deer and Elk Winter Range	29189.59
5.5	Dispersed Recreation and Forest Products	11150.11
8.22	Ski-based Resorts, Existing/Potential	181.15
mw	Medicine Wheel National Historic Landmark and Vicinity	2033.76
non-fs		763.13

The three alternatives analyzed are described in detail in the EIS and are summarized below:

- Alternative 1-No Action-No Livestock Grazing
- Alternative 2- No change- Livestock grazing would continue under current Allotment Management Plans and /or Annual Operating Instructions
- Alternative 3- Proposed Action - Livestock Grazing with adaptive management strategies and vegetative treatment in forests and sagebrush fuels ecosystems

III. THREATENED, ENDANGERED, AND PROPOSED SPECIES AND DESIGNATED CRITICAL HABITAT CONSIDERED AND ANALYZED

A threatened (T), endangered (E), proposed (P), and candidate (C) species list was obtained from the US Fish and Wildlife Service (USFWS) for the Bighorn National Forest (BNF) in 2009 (USDI-FWS, May 22, 2009). No plant species were included on the list for the BNF, therefore there are no species being considered. No further analysis is needed for species that are no known or suspected to occur in the project area, and for which no suitable habitat is present.

IV. SENSITIVE SPECIES CONSIDERED IN THE ANALYSIS

In addition to the USFWS species list, the Regional Forester for Region 2 has designated sensitive species within the region. Forest Supervisors are then directed per FSM 2670.45 to "Determine distribution, status, and trend of threatened, endangered, proposed, and sensitive species and their habitats on Forestlands. In May of 2009, the Region 2 Sensitive Species list was updated by the Regional Forester and the list of species that should be considered on the Bighorn NF are included in Table 3 below.

Species occurrences were obtained from records of the Wyoming Natural Diversity Database (WYNDD 2008). Field inventories for plants were conducted by various botany seasonals from

2004-2009 and include Tucker Galloway, Susan Bell, Matt Spann, Drew King, and Beth Davidson. Observations for these sensitive species have also been conducted annually during periodic field inspections by Rangeland Management Specialists knowledgeable of their habitat and biology, including Jake Powell, Scott Gall, David Beard, Zach Palm, Cliff Winters and Beth Bischoff. In addition, Earl Jensen has been contracted by the Forest to do surveys for TESP plants and these observations are included as well.

Rationale used for the analysis in Table 3 are based on current literature and known or suspected occurrences. These references are included at the end of this document. Species with suitable habitat or known occurrence in the project area, and that may be measurably affected by proposed livestock grazing or prescribed burning and associated actions, are described in narratives following Table 3. Species that would not be affected by project actions were not further evaluated. If suitable but unoccupied habitat is present, then potential effects are evaluated. Additional analysis for "species of local concern" as described in the Revised Forest Plan occurred for this project, and is contained in the project record.

Table 3 Bighorn National Forest Sensitive Plant Species Analyzed in Big 6

Scientific Name	**Common Name**	**Status**	**Known to occur in Big 6**	**Potential habitat present**	**Rationale if not carried forward for analysis**
Botrychium ascendens	Upward lobe-moonwort	G2G3\S1	Yes	Yes	Analyzed in detail below
Botrychium paradoxum	Peculiar moonwort	G2\S1	Yes	Yes	Analyzed in detail below
Cypripedium montanum	Mountain lady's slipper	G4\S1	Yes	Yes	Analyzed in detail below
Cypripedium parviflorum	Yellow lady's slipper	G5T5\S2	Yes	Yes	Analyzed in detail below
Eriophorum chamissonis	Russet cotton-grass or Chamisso's cottongrass	G5\S2	Yes	Yes	Analyzed in detail below
Festuca hallii	Hall's Fescue or plains rough fescue	G4\S2	No	Yes	This species occupies montane meadows from 6,800-11,000'. The project area has potential habitat. It is 'known from a vague 1890's occurrence; however this occurrence has not been relocated, nor have others been found in surveys by Fertig (2001). Fertig (2001) conducted modeling and field sampling of F. *halli* on the Bighorn National Forest, and based on these efforts this plant does not likely occur on the forest. As a result this species was not analyzed in detail. There should be no cumulative effects from this project. **Determination is "*no impact*".**
Parnassia kotzebuei	Grass-of-Parnassia	G5\S2	No	Yes	This species occurs in moist seeps, grassy, wet tundra on thin clay soils, and moist ledges below steep talus slopes from 9,400-11,200'. Two known occurrences are on the forest but none are within the analysis area. There is potential habitat in the project area; however the habitat for this species lies in areas that are

Scientific Name	Common Name	Status	Known to occur in Big 6	Potential habitat present	Rationale if not carried forward for analysis
					not accessible by livestock**. Determination is "*no impact*".**
Penstemon caryi	Cary's beardtongue	G3\S3	Yes	Yes	Analyzed in detail below
Physaria didymocarpa var. lanata	wooly twinpod	G5T2\S2	Yes	Yes	Analyzed in detail below
Pyrrocoma clementis var. villosa	tranquil goldenweed	G3G4T1\S1	Yes	Yes	Analyzed in detail below
Rubus arcticus ssp. acaulis	nagoonberry or northern blackberry	G5\S1	No	Yes	Analyzed in detail below
Utricularia minor	lesser bladderwort	G5\S2	Yes	Yes	Analyzed in detail below

V. SENSITIVE SPECIES INFORMATION

Sensitive plant species with suitable habitat or known occurrence in the project area, and that may be measurably affected by proposed livestock grazing or prescribed burning and associated actions are analyzed in detail below.

Upward-lobed Moonwort ***Botrychium ascendens***

Botrychium ascendens has a global heritage rank of G2G3, a state rank of S1 and a low conservation priority. In Region 2, *B. ascendens* is only known to occur within the Bighorn and Shoshone National Forests of Wyoming. Two occurrences have been documented in the Bighorn National Forest. *B. ascendens* is considered rare over most of its range.

This species is found in montane short and tall riparian willow communities with high moss, gravel, and cobble ground cover, on volcanic or granitic alluvium at 8,000' – 9,000' elevation. Plants are also found on slight knolls above wet meadows. Associated species include: *Potentilla* spp., *Polytrichum* spp. and other *Bryophytes*. Both populations on the Bighorn National Forest are located within the analysis area, and one is located under a *Pinus contorta* (lodgepole) overstory.

Observations and quantitative data have shown that there are several potential threats to the persistence of *Botrychium ascendens*. Threats may include road/trail construction and maintenance, recreation, non-native species invasion, grazing and trampling by livestock and wildlife, the effects of small population size, timber harvest activities, global climate change and pollution. Additional threats may include natural habitat succession or fire suppression, changes in hydrology or catastrophic disturbance. Threats are highly speculative however, due to lack of knowledge of *B. ascendens* within Region 2.

Peculiar moonwort ***Botrychium paradoxum***

Botrychium paradoxum has a global heritage rank of G2, a state rank of S1 and a low conservation priority. Peculiar moonwort's status in Wyoming highly contributes to its overall status. The plant is considered rare over most of its range. Three occurrences are found within the Bighorn National Forest, with additional occurrences documented within three miles of the

Forest Boundary. All three occurrences on the Bighorn National Forest are within the analysis area.

B. paradoxum habitat includes mesic sites such as lake shores, and has been found in open meadows and grassy slopes. It is often on disturbed sites, and found at elevations ranging from 4,000' to 8,000'. It has been found on rotting plant material under dense cover. Associated species include *Abies* spp., *Pinus contorta*, *Salix* spp. and *Potentilla* spp.

Observations and quantitative data have shown that there are several potential threats to the persistence of *Botrychium paradoxum*. Primary threats include changes in hydrology, road/trail construction and maintenance, recreation, exotic species invasion, grazing and trampling by livestock and wildlife, the effects of small population size, timber harvest activities, global climate change and pollution. Threats are highly speculative however, due to lack of knowledge of *B. paradoxum*. Populations may be vulnerable even in unaltered conditions.

Mountain lady's slipper ***Cypripedium montanum***

Cypripedium montanum has a global heritage rank of G4 and a state rank of S1. The geographic distribution of *C. montanum* is from Alaska to central California and east to Alberta and Wyoming. In Region 2, the species is limited to the Bighorn Mountains of Wyoming. Within the Bighorn National Forest, three occurrences have been documented. The three occurrences on the forest are all within the project area, and additional occurrences have been documented within three miles of the Forest boundary. All the occurrences have been found on the east side of the Forest.

C. montanum is found in shady forests are middle elevations. It occurs with *Betula* and *Populus* in areas with thick forb ground cover at elevations ranging from 5,000'-6,000 feet.

Observations and quantitative data have shown that there are several potential threats to the persistence of *C. montanum*. The greatest potential threats include grazing, habitat loss, timber harvest and over-harvesting. Other threats may include, fire suppression and conversely wildfires. Recent trends show the species may be declining and conservation efforts remain a priority. A monitoring program has been initiated on the Bighorn National Forest to better understand the dormancy patterns of the species, as well as other life history traits. Such information will lead to a better understanding of population numbers.

Large yellow lady's slipper ***Cypripedium parviflorum***

Cypripedium parviflorum has a global heritage rank of G5T5 and a state rank of S2. Three occurrences have been documented within the Bighorn National Forest. One of these occurrences is known in the project area in the northeast corner.

C. parviflorum is found in damp mossy woods, bogs and along stream sides at 4000-6400'. It is restricted to calcareous soils.

Observations and quantitative data have shown that plant collecting and habitat destruction are the two primary risks. Habitat destruction may result from management activities such as timber harvest, road construction, weed establishment or natural disturbances. Other risks include wildfire, fire suppression, and prescribed fire. There is no data to quantify population trend in Region 2 (Mergen, 2006).

Russet cotton-grass or Chamisso's cottongrass ***Eriophorum chamissonis***

Eriophorum chamissonis has a global heritage rank of G5, state rank of S2 and a low conservation priority. The geographic distribution of Russet cotton-grass is from eastern Siberia to Newfoundland, south to Minnesota and west to northern Wyoming and Oregon. Populations exist in Park, Teton and Sheridan counties within the state of Wyoming. *Eriophorum chamissonis*

is a circumpolar species with disjunct relictual occurrences in USDA Forest Service Region 2. Occurrences are known from alpine and subalpine wetlands and fens of the central and southwestern mountains of Colorado and northern Wyoming's Bighorn Mountains and Absaroka Range. All 12 documented occurrences in Region 2 are on National Forest System lands. Two occurrences are on the San Juan National Forest, five are on the White River National Forest, six are on the Bighorn National Forest, and two are on the Shoshone National Forest. (Decker, et al. 2006). Of these occurrences, two are within the project area.

Russet cotton-grass is found in bogs within *Pinus contorta* (lodgepole pine) stands at 7350 to 8320 feet. Other associated species are *Salix* species (willow), *Carex* species (sedge) and *Senecio triangularis* (butterweed). (Decker et all. 2006; BNF, 2005).

Information is insufficient to allow an assessment of range-wide population trends. The main threat to this plant is suspected to be degradation of wetland habitats. Decker et al. (2006) describe probable threats to *Eriophorum chamissonis* in Region 2, in order of decreasing priority, hydrologic alterations, grazing, motorized vehicle use, peat mining, fire, and global climate change. Diffuse knapweed was treated within ¼ mile of E. chamissonis occurrence near Meadowlark Lake. Canada thistle is also known to occur nearby.

Decker et al. (2006) says "…herbivory of *Eriophorum chamissonis* has not been documented". "Four of the five Region 2 occurrences in Wyoming are in active livestock grazing allotments. The exception is the occurrence at Preacher Rock Bog Special Interest Area in the Bighorn National Forest, which is fenced to preclude cattle grazing. Occurrences on the Bighorn and Shoshone National Forests are grazed by cattle from mid to late summer through mid September when *Eriophorum chamissonis* is generally in fruit."

Hall's Fescue or plains rough fescue ***Festuca hallii***

Festuca hallii has a global rank of G4, a state rank of S2, and a low conservation priority. This species is distributed from Alberta to Saskatchewan, Manitoba, Montana, and North Dakota. Disjunct populations are found in Ontario, Washington, Wyoming, and Colorado. It is known from 10 confirmed records in Wyoming and one vague, historical record. Five populations have been discovered or relocated since 1994. There are several small populations located on the Shoshone National Forest. The only known occurrence on the Bighorn National Forest is from an 1898 plant mount from the Smithsonian, which offered vague location data as "the head of Crazy Woman Creek." The species is possibly extirpated from the area. There is known habitat within the analysis area, however surveys have found no *F. halli* plants. Fertig (2001) conducted modeling and field sampling of F. *halli* on the Bighorn National Forest, and based on these efforts this plant does not likely occur on the forest.

F. hallii is found in montane meadows, slopes, and edges of open coniferous woods and meadows at 6,800-11,000 feet meadows. It is usually found on soils derived from calcareous parent material. Associated plants include other *Festuca* spp., *Danthonia* spp. *Artemisia* spp., *Lupinus* spp., and *Potentilla* spp. This boreal forest and glaciated plains species is a climax species. Threats include heavy disturbance, such as grazing, road construction, invasive species and climate change. Remnant populations found in Wyoming are especially sensitive to such disturbance.

Kotzebuei's grass-of-parnassus ***Parnassia kotzebuei***

Parnassia kotzebuei has a global heritage rank of G5 and a state rank of S2. In Region 2, P. kotzebuei has only been located in Colorado and Wyoming. There are two known occurrences within the Bighorn National Forest, but none are in the analysis area.

Currently, there is not much information known about this species. Kotzebue's grass of Parnassus is indicative of damp depressions such as lake shores and snow patch areas. This species appears always to flower and ripen seed plentifully (McJannet et al 1997). *P. kotzebuei* occurs in moist seeps, grassy wet tundra on thin clay soil, and moist ledges below steep talus slopes from 9,400-11,200 feet.

In order of decreasing severity, potential threats to this species include effects of small population size, global climate change, motorized recreation, grazing, non-motorized recreation, non-native species invasion, mining, and pollution (Panjabi and Anderson, 2007). The majority of habitat for this species lies in areas that are not accessible by livestock and other listed threats are considered low in severity and extent.

Cary's beardtongue ***Penstemon caryi***

Penstemon caryi is has a global rank of G3 and a state rank of S3, with a medium conservation priority. It is endemic to the Big Horn and Pryor mountains and south central Montana. Currently 15 distinct populations of *Penstemon caryi* have been located within the Bighorn National Forest. All but one of these populations is north of Highway 14. Four populations are known within the project area.

Cary's beardtongue habitat is calcareous rock outcrops and rocky soil within sagebrush and grass plant communities (Fertig, 1994). It is associated with *Artemisia tridentata, Juniperus* spp., *Abies* spp., and *Pinus flexilis* communities from 5,200 to 8,500' elevation. Observations made in 1999 of 5 of the 13 known populations on the Bighorn National Forest indicate that this species prefers actively disturbed soils, such as slumping soils or areas of active erosion (Bighorn collections). At all of these sites, vegetative cover is well under 20% (Heidel & Handley 2004). Populations are capable of colonizing or persisting in disturbed roadside areas, especially if competing vegetation is unable to become reestablished. Montana populations may actually prefer habitats that receive light periodic disturbance (Heidel & Handley 2004). Known locations on the Bighorn National Forest of this species are confined to soil map units 20, 21, 27, 30, 32 and 39 (USDA 1986).

This species has been located in grazed areas, road cuts, and in old burns and seems to like some disturbance. It has been documented to be present in an area on the north end of the Forest that was previously treated through prescribed fire, and observations indicate it was doing well.

It is potentially threatened by loss of habitat from road construction and limestone quarrying, and secondarily threatened from grazing, trampling, and weed competition. Fertig (1999a) indicates that this plant may be threatened by grazing. However, the risk is considered to be low because of preference of cattle for grasses for forbs (Todd, 1969). No grazing has been observed in existing populations (Bornong, 1999 field surveys in grazed areas). The plants leaves and stems are somewhat "waxy" or "leathery", which may contribute to non-palatability. Fertig (1999a) indicates that this plant may be threatened by trampling. This is consistent with 1999 field observations, where plants were not grazed, but livestock walked through populations (Bornong, 1999 field surveys in grazed areas.)

Field surveys conducted at 17 of 23 extant Wyoming occurrences from 1999 to 2001 and one monitoring study indicate that the overall threats to P. *caryi* from human activities are likely less imminent or of lower impact than previously suspected. However the species' limited range, accessible habitat, and habitat specificity make it vulnerable to large-scale habitat modification in the future.

Common twinpod ***Physaria didymocarpa var. lanata***

Physaria didymocarpa var. lanata has a global heritage rank of G5T2 and a state rank of S2. The species is a regional endemic of north-central Wyoming and adjacent Montana. Within the Bighorn National Forest, seven occurrences have been documented and one of these is within the analysis area.

P. didymocarpa occupies slopes & road cuts with red scoria & clay shale substrates. Habitat also includes calcareous substrates and gravelly unstable slopes at 3,600'-9,680'.

P. didymocarpa is potentially threatened by coalbed methane development, coal mining, herbicide use, road development, concentrated livestock trampling, and concentrated recreation use of its habitat. On the Bighorn National Forest, all but coal mining and methane development are potential threats.

P. didymocarpa is a short-lived perennial that occupies a stressful environment with low water availability, extreme temperatures, and full exposure to the forces of wind erosion (Heidel, et al 2004). One can assume a portion of *P. didymocarpa* habitat may be inaccessible to livestock, based on soil type and exposed rock requirements. The one known occurrence in the analysis area occurs on a rocky slope not accessed by cattle.

Tranquil goldenweed **Pyrrocoma clementis var. villosa**

Pyrrocoma clementis var. villosa has a global heritage of G3G4T1, state ranking of S1, and a lower conservation priority. Distribution of this plant is from west-central Wyoming to eastern Utah and Colorado. In Wyoming tranquil goldenweed is located within Big Horn, Fremont, Johnson, Sheridan, and Washakie counties. It has been documented six times on the Bighorn National Forest and its abundance and range is not well understood.

Surveys in 2005 and 2007 found several large populations and other individual plants within the project area. These were found to occur primarily along and within ½ mile or less of roads. Plants were found in gravelly soils with little competition from other plants and on nearly flat to slight slopes. Observations made in 2005 indicate that grasslands may be a preferred habitat type and in the absence of prescribed and/or wildfire it is possible that available habitat has declined due to suppression activities. In Wyoming, this species is found in big sagebrush community types, grasslands and montane meadows, often on limestone substrates at 7,000 to 9,000 feet. Few occurrences are known on the Forest; however

The four occurrences known to be extant on the Bighorn National Forest are in areas managed primarily for livestock grazing and recreation. Cattle grazing can negatively affect other *Pyrrocoma* species, but the effects on *P. clementis var. villosa* are not known. The current levels of livestock grazing appear to be compatible with persistence of *P. clementis var. villosa* (Ladyman 2006b). The Hunt Mt. Travel Management Plan FONSI put restrictions on motorized vehicle traffic in a large portion of the analysis area and this is expected to reduce disturbance in P. clementis var. villosa habitat and is expected to benefit the species. The locations of some of the populations still have the potential to be disturbed by camping and vehicle travel, as these activities are permissible within 300 feet of an open Forest Service Road. A significant decline in *P. clementis var. villosa* abundance on the Bighorn National Forest has the potential to impact viability of the species negatively rangewide because this Forest contains the largest known occurrences of the taxon. (Ladyman 2006b).

Northern Blackberry **Rubus arcticus ssp. acaulis**

Rubus arcticus ssp acaulis has a global rank of G5, a state rank of S1 and a low conservation priority. This species is distributed from Alaska to Newfoundland, south to British Columbia and Minnesota and in the Rocky Mountains from Montana to Colorado. Within Wyoming, northern

blackberry is considered peripheral and populations have been identified in Johnson and Teton counties. Three occurrences have been identified on the Bighorn National Forest.

The Sourdough Creek population has two very distinct habitats. One of which occurs in open, *Salix planifolia/Carex utriculata* (willow/beaked sedge) communities and the second in shady *Picea engelmannii/Linnaea borealis* (Engelmann spruce/twinflower) habitat (Fertig 2000a). Vegetation cover is typically 90 to 95% with at least 50% of all cover provided by mosses (Fertig 2000a). The Sourdough population has annually been monitored for population trends since 2001, and the trend appears to be stable. None of the occurrences are within the analysis area.

The most likely immediate and potential threat to *Rubus arcticus ssp. acaulis* occurrences is habitat loss. Anthropogenic causes of habitat loss include human recreation activities, livestock grazing, and extraction of natural resources (e.g., timber and peat). Logging, recreation, and water impoundments have been reported as the main threats to R. arcticus ssp. acaulis populations in Wyoming. Road construction and improvements may pose a threat to some occurrences, particularly those in Region 2. Water availability may be one of the most critical environmental variables for *R. arcticus ssp. acaulis*, and any circumstance that leads to drier habitat conditions is likely to pose a substantial threat.

Much of the riparian habitat on the Bighorn National Forest has been surveyed during riparian classification work (Girard, M., D. L. Wheeler, and S. B. Mills. 1997) and no additional populations were discovered until the 2006 field season. The reason for this is unknown and northern blackberry is probably not occupying its full potential range (Fertig, 2000).

Lesser Bladderwort ***Utricularia minor***

Utricularia minor has a global rank of G5, state rank of S2 and a low conservation priority. Utricularia minor is a geographically widespread, aquatic plant species that is rare throughout much of its range. Known populations in Region 2 occur primarily in fens, which are highly specialized peatland habitats restricted in distribution and abundance. U. minor also occurs in freshwater marsh habitat. There are four occurrences on the Bighorn National Forest, and all four occurrences are in the project area. One is near Meadowlark Lake and the other three are in wetlands near Sawmill and Twin Lakes.

Lesser bladderwort is a perennial aquatic herb with submersed, weak stems and leaves. This plant is found submerged in shallow ponds, lakes and slow-moving streams at 6,600 to 8,600 feet (WYNDD 2000). Habitat for this plant is extremely limited and it is restricted to specialized microsites. Bighorn National Forest habitat includes bog lakes, with associated *Carex* spp., *Nuphar* spp. and *Menyanthes* spp.

Bladderworts can live in nutrient poor, rather acidic, boggy conditions (Washington State Department of Ecology 2003). The bladder-like structure on their branches is actually a small vacuum trap that catches tiny aquatic animals. Once caught, the plant uses digestive juices to absorb the animal (Washington State Department of Ecology 2003).

Much of the basic biology and ecology of *U. minor* is unstudied and unknown. Threats may include changes in hydrology, deterioration of wetland habitat, and invasive species. Therefore, to contribute to the persistence of *U. minor*, management activities should make every effort to maintain water quality (Neid, 2006).

VI. EFFECTS OF THE ALTERNATIVES

Existing Conditions

The species overviews immediately described above, along with the species conservation assessments are considered the existing condition assessments for each individual species. The following documents are tiered to and incorporated by reference. They provide additional

existing condition background and information for the sensitive plants species at the forest wide scale:

- Regan et al. 2004. Current Landscape Condition for the Bighorn National Forest Ecosystem. Rocky Mountain Region of the USDA Forest Service. Unpublished document on file at the Forest Supervisor's Office.
- USDA Forest Service. 2005. Final Environmental Impact Statement for the Revised Land and Resource Management Plan - Bighorn National Forest - Appendix K: BIological Evaluation.
- USDA Forest Service. 2005. Various individual plant species reports and assessments on file in the Forest Plan record. On file at the Bighorn NF Supervisor's Office.

Vegetation is varied due to the differences in elevation, aspect, slope, and varying topography across the analysis area. Elevations range from approximately 4,500' to 11,500'. At the highest elevations, subalpine environments influence the vegetation and habitat is above timberline, with shallower soils and talus slopes. Sagebrush-grasslands habitat types are fairly dominant across the analysis area, with some of this being dominated more by sagebrush than grass/forb species. The west slope joins BLM lands and consists of drier desert type vegetation including mountain mahogany and blue bunch wheatgrass. Douglas fir, lodge pole pine, and limber pine trees are encroaching into aspen stands and meadows throughout the Forest. The east slope tends to consist of Lodgepole Pine habitat types. Overall, vegetation productivity, palatability, diversity and vigor are variable across the landscape. Fire regimes once characterized by fast-moving, low intensity ground fires are now in a condition class to support higher intensity fires. Livestock grazing, wildfires, prescribed fires, mining, recreation, and timber harvest are activities that have occurred across portions of the analysis area and have had effects on succession.

Current management direction and desired conditions for Threatened, Endangered, Proposed and Sensitive species on the Bighorn National Forest can be found in the following documents:

- Forest Service Manual and Handbooks (FSM/FSH 2670/2609)
- National Forest Management Act (NFMA)
- Endangered Species Act (ESA)
- National Environmental Policy Act (NEPA)
- USDA Regulation 9500-4
- Bighorn National Forest Revised Land and Resource Management Plan, November 2005 (referred to as the Forest Plan) (USDA 2005)
- Region 2 Conservation Assessments available at: http://www.fs.fed.us/r2/projects/scp/assessments/index.shtml
- Regional Forester policy and management direction (i.e., Sensitive Species List)

The applicable Forest Plan standards and guidelines are as follows:

1) Objective 1.b. page 1-2 and associated strategies 1 and 2 page 1-3

2) Biological Diversity guideline #7 Page 1-28 "Maintain, or mitigate impacts to, important habitat types including alpine tundra; moss community in Dry Fork; bogs, fens, and springs (including Preacher Rock Bog and Willow Swamp on Powder River District); talus slopes; cliffs; and rock outcrops."

3) TES Standard #3. Pg 1-40

Direct, Indirect, and Cumulative Effects Analysis

Effects Timeframes

The timeframes on which the analysis is based upon are necessary in order to more clearly analyze the effects of livestock grazing on the resources. For the purpose of this project, short term effects are defined as occurring within or lasting five years or less. Long term effects are those occurring after or lasting greater than five years. These definitions apply to all resource areas.

Effects Definitions

Direct environmental effects are those occurring at the same time and place as the initial cause or action. A direct effect would include such things as grazing or trampling. Indirect effects are those that occur later in time or a spatially removed from the activity, but would be significant in the foreseeable future. An indirect effect would include such things as soil movement due to loss of ground cover, change in vegetative composition, or reduction of the water table in a riparian area. Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects analysis involves assumptions and uncertainties. Cumulative effects analysis provides the opportunity to evaluate future management options in the context of other developments in the analysis area. The sum of effects from individual activities in addition to those of the alternative being analyzed must be measurable in order to be considered a cumulative effect.

The spatial boundary for the sensitive plants cumulative effects analysis is the five project area boundaries. The temporal boundary varies by alternative and activity. Under alternatives 2 and 3, the time livestock grazing would affect sensitive plant species is indefinite because livestock grazing is ongoing. For livestock grazing under alternative 1 and for other activities in the analysis area, impacts were evaluated for 10 to 15 years following implementation of this decision. The Forest's rare plant strategy (USDA Forest Service, 2009) outlines a process for: (1) prioritizing species surveys so that we learn what species are indeed rare, and which species may be more common than currently thought; and, (2) to identify needed monitoring for the truly rare species (such as the annual *Rubus* monitoring). This program has been successful in validating the rarity of some species, and moving other species to categories of less conservation concern.

Nearly all of the projects listed in the past, present and reasonably foreseeable actions table in Chapter 3 of the EIS affect some of the sensitive species. The most widespread effects are from livestock grazing, road construction, and fire, both wildfire and prescribed fire. Timber harvest itself has generally very little to no effect on the sensitive species, because the Bighorn's sensitive species generally do not occur in the forest habitats that are typically logged on the Bighorn (lodgepole, spruce-fir and Douglas-fir). While invasive species can be a threat to any native species, the threat on the Bighorn NF is currently low due to the low occurrence of invasive species.

Effects of Alternative 1 (No Grazing)

Under Alternative 1, no livestock grazing and trampling would occur. This in turn would allow soils to develop and recover at an optimum rate. Areas with compacted or hummocked soils would be expected to recover after ten years (Bescheta, R.L., Kauffmann, J.B. 2000.), but may never reach pre-disturbance conditions. Utilization on shrubs, grasses and sedges in riparian areas would decrease, resulting in an improvement in riparian conditions. Water tables may be expected to rise over time in some areas, and riparian vegetation may replace encroaching non-

riparian species. Litter buildup would accumulate more rapidly and would aid in reduced erosion and sedimentation. Plant communities would progress through natural succession towards potential in both uplands and riparian areas, where not presently at potential. Other multiple use activities would continue to occur across the landscape including grazing by wildlife, recreation, and timber harvest. Livestock grazing and associated management activities would no longer be a potential vector for introduction or spread of invasive species.

For the vacant grazing allotments, it is expected that the above effects may have already occurred to some extent since livestock have not been grazing them for a period of time already. No new prescribed fires are proposed under alternative 1, but previously decided prescribed fire activities would continue. With no additional fuels treatment activities, conifer encroachment in meadows is expected to continue and sagebrush densities would increase in that habitat type. Treatment of noxious weeds would continue to occur under this alternative.

Botrychium ascendens and B. paradoxum

Direct and Indirect Effects
These species are both found within the analysis area within active grazing allotments in areas accessible to livestock. No grazing, trampling, or introduction of noxious weeds from livestock would occur under this alternative. Improvements to hydrology and riparian vegetation are expected to occur. This in turn would be expected to improve Botrychium habitat, and threats presently posed through livestock grazing or trampling would no longer occur. No known invasive species are present in known locations or habitat for this species, and livestock would no longer be a vector. The absence of prescribed fire would have no effect to this species or its habitat since it is typically found in wet riparian type environments which fire would not be expected to carry through.

Cumulative effects:
If invasive species become more prevalent, this could threaten habitat. Fire poses little threat to these species, as habitats are relatively wet. Road building is a low threat because sensitive species surveys are conducted prior to construction. However, the threat to *Botrychium* species remains since these species can be hard to locate. Threats are highly speculative, and populations may be vulnerable even in unaltered conditions.

Determination is **"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing".**

Cypripedium montanum and *C. parviflorum*

Direct and indirect effects
These species are both found in the analysis area in areas not easily accessible by livestock. Under Alternative 1, removal of livestock grazing would be expected to have no effect on this plant or its habitat, since livestock do not graze in the known occurrence areas due to the ruggedness of the habitat. No known invasive species are present in known locations or habitat, and livestock would not be a vector due to the terrain. The absence of prescribed fire is expected to have no effect as well, since this plant is located in moist, timbered areas where a prescribed fire would not be typically conducted.

Cumulative effects
If invasive species become more prevalent, this could threaten habitat. *Cypripedium montanum* occurs in habitats that historically have been subject to naturally occurring fire. Wildfires could

still occur and in 2003 one did burn in an area with known Cypripedium; however the effects of the fire on the species and habitat are unknown. The effect of fire on this species could be beneficial; current monitoring that is ongoing along the Story-Penrose trail is investigating the effects of fire on this species. Surveys prior to road construction should be successful for this species as it is readily identifiable.

Determination is **"may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing."**

Eriophorum chamissonis

Direct and indirect effects
No grazing, trampling, or introduction of noxious weeds from livestock would occur. It is expected that there would be an improvement in habitat for this species because the water table could rise in areas of existing and potential habitat that may currently be drying out. However, there could still be effects from conifer encroachment in the absence of prescribed fire, which could result in continued drying of riparian areas.

Cumulative effects
If invasive species become more prevalent, this could threaten habitat. The effect of other ungulates and recreation users would continue. Fire is not likely to carry through the relatively wet habitat this species occurs in. Surveys prior to road construction should be successful for this species as it is readily identifiable.

*Determination is "***may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing"**

Penstemon caryi

Direct and indirect effects
Penstemon caryi is found in areas both accessible and inaccessible to livestock in the analysis area. This plant likes some level of soil disturbance, but trampling of the plants themselves is a risk. Removal of livestock under Alternative 1 would stop any trampling that may be occurring and livestock would no longer be a vector for dispersal of invasive species. In comparing GIS invasive and sensitive plant layers there is isolated incidents of invasive species existing near areas of existing populations. The closest occurrence was within 80 feet, but appears to be an isolated incident. It is not expected to be a big threat due to the present program of treatment of noxious weeds. The absence of prescribed fire may have a negative effect as this species has been located in old burns and seems to like some disturbance. *P. caryi* has been documented to be present in an area on the north end of the Forest that was previously treated through prescribed fire, and observations indicate it was doing well.

Cumulative effects
If invasive species become more prevalent, this could threaten habitat. Fire is unlikely to carry through the sparsely vegetated habitat this species typically occurs within; however if it should carry through habitat it may have a positive effect since it has been located in old burns. This plant seems to like some levels of disturbance and is found in old road cuts as well. Surveys prior to road construction should be successful for this species as it is readily identifiable.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**".

Pyrrocoma clementis var. *villosa*

Direct and indirect effects
Pyrrocoma clementis var. villosa occurs within the analysis area, in an active grazing allotment. Although grazing is considered to be a threat, the current levels of livestock grazing appear to be compatible with persistence of *P. clementis var. villosa* (Ladyman 2006b). Ladyman (2006b) does not list fire as a threat to this species. It is expected that in the absence of livestock grazing there would be a neutral effect since it is persisting in an area with grazing.

Cumulative effects
If invasive species become more prevalent, this could threaten habitat. Road building could be a threat to this species as well. Observations made in 2005 indicate that grasslands may be a preferred habitat type and in the absence of prescribed and/or wildfire it is possible that available habitat has declined due to suppression activities. A significant decline in *P. clementis var. villosa* abundance on the Bighorn National Forest has the potential to impact viability of the species negatively rangewide because this Forest contains the largest known occurrences of the taxon. (Ladyman 2006b).

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**".

Physaria didymocarpa

Direct and Indirect effects
Physaria didymocarpa is within the analysis area and potential habitat is on rockier slopes not frequented by livestock. Therefore, removal of livestock grazing would be expected to have no effect on this plant or its habitat. Similarly fire would not be expected to occur in this habitat type nor would it carry, so lack of prescribed fire in Alternative 1 would have no effect. Invasive species are not known to occur in areas of any populations.

Cumulative effects

With no direct or indirect effects, there are no cumulative effects from the alternative.

Determination is "**No impact".**

Rubus arcticus ssp. *acaulis*

Direct and indirect effects
One of the known populations of *R. arcticus ssp. acaulis* on the Forest on Sourdough Creek is monitored annually for population trends. This population is not in the analysis area, but it provides information as to potential effects of livestock grazing on the species and habitat. In the ten years of monitoring, there has been no statistically validated change in the monitored population. That site has been influenced by livestock grazing pressure for at least 100 years. Livestock do not appear to select for the species in the area. *R. arcticus* habitat includes the top

of mossy hummocks. It is expected that there would be an improvement for *Rubus arcticus* ssp. *acaulis* with the removal of livestock grazing-because the water table could rise in some areas of existing and potential habitat that may be currently drying out. Any effects due to trampling by livestock would also be eliminated. Fire is not likely to carry through the relatively wet habitat this species occurs in. However, there could still be effects from conifer encroachment in the absence of prescribed fire, which could result in drying of riparian areas.

Cumulative effects
If invasive species become prevalent, this could threaten habitat. Surveys prior to road construction should be successful for this species as it is readily identifiable.

Determination is ““**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing”**.

Utricularia minor

Utricularia minor is present within the analysis area. It is expected that the absence of livestock grazing may have a positive effect on this plant or habitat. Cattle do not tend to concentrate in very boggy areas; however they may water on the edges of some shallow ponds, lakes, and streams. It is expected that limited habitat is accessible by livestock. Under this alternative no additional prescribed fire is proposed and this would have no effect since the wetter habitat would not carry fire. It is likely that the benefits to *Utricularia* habitat are extremely small.

Cumulative effects

The most likely threat is from invasive species. Wildfire is unlikely to affect this species habitat, because of buffers around the edge of the ponds that are unlikely to burn. Road building is not considered a threat. The effect of other ungulates as well as recreation users would continue.

Determination is **“may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.”**

Effects of Alternative 2

Livestock grazing and trampling would continue under current grazing management strategies under the Forest Plan (revised 2005), current Allotment Management Plans (AMPs) and Annual Operating Instructions (AOIs) for the active allotments. It is expected that allowable use guidelines are met under Alternative 2. This alternative would allow for the slowest recovery of riparian and upland health and function. Continued deterioration of some areas affected by past livestock grazing, and new impacts to additional sites are still possible under Alternative 2. Areas with compacted or hummocked soils would be expected to remain that way. Litter buildup would be slower than in Alternative 2 or 3. Vacant allotments would continue to have no livestock grazing, and the effects would be similar to Alternative 1. Other multiple use activities would continue to occur across the landscape including grazing by wildlife, recreation, and timber harvest. Livestock grazing and associated management activities would continue to be a possible vector for introduction and spread of invasive species. No new prescribed fires are proposed under Alternative 2, but previous prescribed fire activities would continue. With no additional fuels treatment activities, conifer encroachment into meadows is expected to continue and sagebrush densities would increase in that habitat type. Treatment of noxious weeds would continue to occur under this alternative.

Botrychium ascendens and B. paradoxum

Direct and indirect effects
Botrychium ascendens and B. paradoxum are both found within the analysis area within active grazing allotments, and are in areas accessible to livestock grazing and trampling. No invasive species are known to be present in the areas of occurrence, but livestock would continue to be a possible vector. Threats presently posed through livestock grazing or trampling would continue. The absence of prescribed fire would have no effect to this species or its habitat since it is typically found in wet riparian type environments which fire would not be expected to carry through.

Cumulative effects

Cumulative effects would be similar to alternative 1. Threats are highly speculative, and populations may be vulnerable even in unaltered conditions.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**".

Cypripedium montanum and *C. parviflorum*

Direct and indirect effects
Cypripedium montanum and *C. parviflorum* are only known to occur on the east side of the Forest. The occurrences that are within the analysis area are not in areas that are easily accessible by livestock. No known invasive species are present in known locations or habitat, and livestock would not be a vector due to the terrain. The absence of prescribed fire is expected to have no effect as well, since this plant is located in moist, timbered areas where a prescribed fire would not be typically conducted.

Cumulative effects

Cumulative effects would be similar to alternative 1.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**".

Eriophorum chamissonis

Direct and indirect effects
E. chamissonis occurs in active grazing allotments within the analysis area, and while "herbivory of E. chamissonis has not yet been documented, other member of this genus are subject to herbivory (Decker et al. 2006). Livestock would continue to be a noxious weed vector. The effect of other ungulates as well as recreation users would continue. For such reasons, the benefits of Alternative 1 over 2 and 3 may be inconsequential. The absence of additional prescribed fire could lead to encroachment into habitat and lead to drying of riparian areas.

Cumulative effects
Cumulative effects would be similar to alternative 1.

*Determination is "***may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing".** The determination is based on current existence of populations in grazing allotments and the species' G5 federal ranking.

Penstemon caryi

Direct and indirect effects
Penstemon caryi is found in areas both accessible and inaccessible to livestock in the analysis area. Continuing livestock grazing at current levels may affect some plants through trampling which is thought to be a greater threat than grazing itself. This plant likes some level of soil disturbance. In comparing GIS invasive and sensitive plant layers there is isolated incidents of invasive species existing near areas of existing populations. The closest occurrence was within 80 feet, but appears to be an isolated incident. It is not expected to be a big threat due to the present program of treatment of noxious weeds. The absence of prescribed fire may have a negative effect as this species has been located in old burns and seems to like some disturbance. *P. caryi* has been documented to be present in an area on the north end of the Forest that was previously treated through prescribed fire, and observations indicate it was doing well.

Cumulative effects
If invasive species become more prevalent, this could threaten habitat. Fire is unlikely to carry through the sparsely vegetated habitat this species typically occurs within; however if it should carry through habitat it may have a positive effect since it has been located in old burns. This plant seems to like some levels of disturbance and is found in old road cuts as well. Surveys prior to road construction should be successful for this species as it is readily identifiable.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**".

Pyrrocoma clementis var. *villosa*

Direct and indirect effects
Pyrrocoma clementis var. *villosa* occurs within the analysis area in active grazing allotment. Although grazing is considered to be a threat, the current levels of livestock grazing appear to be compatible with persistence of *P. clementis var. villosa* (Ladyman 2006b). Ladyman (2006b) does not list fire as a threat to this species.

Cumulative effects

Cumulative effects are similar to alternative 1.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**".

Physaria didymocarpa

Direct and indirect effects
Physaria didymocarpa is within the analysis area and potential habitat is on rockier slopes not frequented by livestock. Similarly fire would not be expected to occur in this habitat type nor

would it carry, so lack of prescribed fire in Alternative 2 would have no effect. Invasive species are not known to occur in areas of any populations.

Cumulative effects

Cumulative effects are similar to alternative 1.

Determination is "**No impact".**

Rubus arcticus ssp. *acaulis*

Direct and indirect effects
The likelihood of *R. arcticus ssp. acaulis* occurring in the project area is slim. An intensive forest-wide survey effort in the latter half of the 1990's failed to locate new populations of the species. The known populations of *R. arcticus ssp. acaulis* on the Forest is outside the project area and one is monitored annually for population trends. The known locations have been influenced by livestock grazing for at least 100 years. Livestock do not appear to select for the species in the area. *R. arcticus* habitat includes the top of mossy hummocks. Prescribed fires are not proposed under this alternative. However, there could still be effects from conifer encroachment in the absence of prescribed fire, which could result in drying of riparian areas.

Cumulative effects
Cumulative effects would be similar to alternative 1.

Determination is ""**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing"**.

Utricularia minor

Direct and indirect effects
Utricularia minor is present within the analysis area. Cattle do not tend to concentrate in very boggy areas or wade into larger bodies of water. They may however, water on the edges of some shallow ponds, lakes, and streams. It is expected that limited habitat is accessible by livestock, and the effects would be minimal. Under this alternative no additional prescribed fire is proposed and this would have no effect since the wetter habitat would not carry fire.

Cumulative effects
Cumulative effects would be similar to alternative 1.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing".**

Effects of Alternative 3

Alternative 3 would allow for livestock grazing in the analysis area using adaptive management strategies following the Forest Plan (revised 2005), provide for updated AMPs, and associated AOIs. This is expected to make achievement of the utilization guidelines and desired conditions practicable. Some allotments previously classified as vacant under alternative 2 would become active allotments, while other vacant allotments would become forage reserve allotments. It is expected that upland and riparian health and function would improve at a slower rate than Alternative 1, but faster than Alternative 2, for the grazing allotments that are presently active.

Allotments that have been vacant and are now stocked under Alternative 3 are expected to stimulate the plants through periodic grazing and help reduce the potential for "wolfy" plants. A wolfy plant is one that has old cured stems and reduced nutritional value due to lack of stimulation. Livestock grazing and associated management activities would continue to be a possible invasive species vector. Other multiple use activities would continue to occur across the landscape including grazing by wildlife, recreation, and timber harvest. Alternative 3 would also include prescribed fire in both sagebrush grassland and timber ecosystems for fuels management, and wildlife habitat and forage improvement. This activity is expected to set back succession and open up meadows that have heavy conifer encroachment. Treatment of noxious weeds would continue to occur under this alternative. The only sensitive species within the proposed prescribed fires is *Physaria didymocarpa*. Adaptive management strategies allow for fencing if monitoring shows there are effects to plants or habitat. Spikemoss (*Selaginella densa*) treatment is proposed as an adaptive management strategy in Alternative 3 in portions of the Tourist, Rapid Creek C&H, and Goose Creek C&H allotments.

Botrychium ascendens and B. paradoxum

Direct and indirect effects

Botrychium ascendens and B. paradoxum are both found within the analysis area within active grazing allotments, and are in areas accessible to livestock grazing and trampling. No invasive species are known to be present in the areas of occurrence, but livestock would continue to be a possible vector. Threats presently posed through livestock grazing or trampling would continue. Although prescribed fire is part of this alternative, there are no burns proposed in Botrychium habitat. There would be no effect to this species or its habitat since it is typically found in wet riparian type environments which fire would not be expected to carry through.

Spikemoss (*Selaginella densa*) treatment is proposed in the first 4-6" of soil in 50-300 acres plots within the Tourist, Rapid Creek C&H, and Goose Creek C&H allotments, through use of a mechanical harrow or chisel. This activity is expected to break up the spike moss mat and allow for revegetation of native species. *Botrychium ascendens* and *Botrychium paradoxum* have both been found adjacent to part of the treatment areas in the Tourist allotment. *Botrychium* habitat is also present in riparian areas adjacent to planned spike moss treatments in uplands on the Big Goose C&H allotment. Treatment areas would be on upland sites with less than 10% slopes, away from water influence zones and any *Botrychium* habitat or populations. Treatment areas would be seeded with a native seed mix if natural plant re-establishment does not occur, and would be given adequate time to re-vegetate before livestock grazing occurred again in the future. Direct effects to *Botrychium a.* or *p.* species and/or habitat are not expected to occur, as spikemoss grows in dry, low gradient, upland sites, and is found associated with Idaho fescue/Carex, and Idaho fescue/Lupine vegetation types. *Botrychium a.* and *p.* are predominantly found in riparian habitats, but have been known to occur in open meadows, grassy slopes, and slight knolls above wet meadows with potentilla spp., Polytrichum spp, Abies spp, Pinus contorta, and salix. The hydrology and soils specialist report noted that "the removal of spikemoss mats may indirectly affect the hydrologic cycle as spikemoss mats absorb nearly all available water during low intensity rainfall events, which decreases the potential for runoff and erosion (Van Dyne and Vogel 1967). However, there is no evidence that an increase in surface runoff and erosion would be measurable, when comparing a landscape vegetated by spikemoss mats to a landscape vegetated by native grasses." It is expected that there would not be any increase in sedimentation to the riparian systems and that the design and location of the treatments would have no effects on *Botrychium a.* or *p.* or its habitat. The Air, Soils, Geology Specialist's Report found in the project file describes affects of spikemoss treatment on the soil

resource. It describes both soil disturbance and ground cover effects and was reviewed and is incorporated by reference in this report. Design criteria outlined in the Air, Soil, and Geology Specialists Report would further prevent any potential effects to habitat.

Cumulative effects

Cumulative effects would be similar to alternative 1 and 2. Threats are highly speculative, and populations may be vulnerable even in unaltered conditions.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**".

Cypripedium montanum

Direct and indirect effects
Cypripedium montanum is known to occur on the east side of the Forest. The occurrences that are within the analysis area are not in areas that are easily accessible by livestock. No invasive species are known to be present in the areas of occurrence. *Cypripedium montanum* occurs in habitats that historically have been subject to naturally occurring fire, and therefore, it is anticipated there would be effects from the fire actions.

Cumulative effects
Cumulative effects under alternative 3 add prescribed fire to wildfire effects and may be beneficial. Wildfires could still occur and in 2003 one did burn in an area with known Cypripedium; however the effects of the fire on the species and habitat are unknown. The effect of fire on this species could be beneficial; current monitoring that is ongoing along the Story-Penrose trail is investigating the effects of fire on this species. Surveys prior to road construction should be successful for this species as it is readily identifiable.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**".

Cypripedium parviflorum

Direct and indirect effects
Cypripedium parviflorum is known to occur on the east side of the Forest. The occurrences that are within the analysis area are not in areas that are easily accessible by livestock. No invasive species are known to be present in the areas of occurrence. *Cypripedium parviflorum* occurs in habitats that are typically too wet to carry prescribed fire, and therefore, it is anticipated there would be no effects from the fire actions. No prescribed fires are scheduled in areas with present known species.

Cumulative effects
If invasive species become more prevalent, this could threaten habitat. The known location of this species is on steep slopes where management practices of logging, road construction, grazing, etc would likely not occur. Wildfires have gone through the area, but the effects are unknown.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**".

Eriophorum chamissonis

Direct and indirect effects
It is estimated that little, if any, herbivory would occur since livestock grazing to Forest Plan guidelines will provide sufficient amounts of other more palatable plants to graze. Livestock would continue to be a noxious weed vector. The presence of additional prescribed fire could improve habitat if meadow encroachment is occurring.

Cumulative effects
The effect of other ungulates as well as recreation users would continue. The benefits of Alternative 1 over 2 and 3 may be inconsequential.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**". The determination is based on current existence of populations in grazing allotments and the species' G5 federal ranking.

Penstemon caryi

Direct and indirect effects
Penstemon caryi is found in areas both accessible and inaccessible to livestock in the analysis area. Continuing livestock grazing at current levels may affect some plants through trampling which is thought to be a greater threat than grazing itself. This plant likes some level of soil disturbance. In comparing GIS invasive and sensitive plant layers there is isolated incidents of invasive species existing near areas of existing populations. The closest occurrence was within 80 feet, but appears to be an isolated incident. It is not expected to be a big threat due to the present program of treatment of noxious weeds. Prescribed fire is proposed under this alternative and may have a beneficial effect, as this species has been located in old burns and seems to like some disturbance. *P. caryi* has been documented to be present in an area on the north end of the Forest that was previously treated through prescribed fire, and observations indicate it was doing well.

Cumulative effects
If invasive species become more prevalent, this could threaten habitat. Fire is unlikely to carry through the sparsely vegetated habitat this species typically occurs within; however if it should carry through habitat it may have a positive effect since it has been located in old burns. This plant seems to like some levels of disturbance and is found in old road cuts as well. Surveys prior to road construction should be successful for this species as it is readily identifiable.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**".

Pyrrocoma clementis var. *villosa*

Direct and indirect effects
Pyrrocoma clementis var. *villosa* occurs within the analysis area in an active grazing allotment. Although grazing is considered to be a threat, the current levels of livestock grazing appear to be compatible with persistence of *P. clementis var. villosa* (Ladyman 2006b). Prescribed fire is

proposed under this alternative; however it is unlikely it will have any effect. Ladyman (2006b) does not list fire as a threat to this species.

Cumulative effects

Cumulative effects would be similar to alternative 1 and 2.

Determination is "**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing**".

Physaria didymocarpa

Direct and indirect effects
Physaria didymocarpa is within the analysis area and potential habitat is on rockier slopes not frequented by livestock. Under this alternative prescribed fire is proposed, however it is unlikely that fire could carry through the sparse vegetation.

Cumulative effects
With no direct or indirect effects, there are no cumulative effects from the alternative.

Determination is "**No impact".**

Rubus arcticus ssp. *acaulis*

Direct and indirect effects
The likelihood of *R. arcticus ssp. acaulis* occurring in the project area is slim. An intensive forest-wide survey effort in the latter half of the 1990's failed to locate new populations of the species. The known populations of *R. arcticus ssp. acaulis* on the Forest is outside the project area and one is monitored annually for population trends. The known locations have been influenced by livestock grazing for at least 100 years. Livestock do not appear to select for the species in the area. *R. arcticus* habitat includes the top of mossy hummocks. Prescribed fires are proposed under this alternative. Fire is not likely to carry through the relatively wet habitat this species occurs in.

Cumulative effects
Cumulative effects would be similar to alternative 2.

Determination is ""**may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing"**.

Utricularia minor

Direct and indirect effects
Utricularia minor is present within the analysis area. Cattle do not tend to concentrate in very boggy areas or wade into larger bodies of water. They may however, water on the edges of some shallow ponds, lakes, and streams. Prescribed fire is unlikely to affect this species habitat, because of buffers around the edge of the ponds that are unlikely to burn. It is expected that limited habitat is accessible by livestock, and the effects would be minimal.

Cumulative effects
Cumulative effects would be similar to alternative 2.

Determination is **may adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing** "

Monitoring Recommendations and Design Criteria

Design Criteria 12 of EIS reads:

> If any TES plant or animal species or heritage sites are found, they will be fenced, or other protective measures may be applied, if monitoring indicates that livestock grazing is the cause of a downward trend in the population. Protective measures would follow appropriate NEPA analysis.

Monitoring for rare plants will be accomplished through the regular program indicated in the 5 year action plan for rare plants, and through the observational monitoring of the range conservationists as they conduct their 'grazing' monitoring.

Other design criteria for invasive species, best management practices, long term trend monitoring at benchmark sites, and annual utilization monitoring, among others, have already been included as a 'package of actions' in Chapter 2 of the EIS. This entire package of actions will have beneficial impacts on sensitive plant species.

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